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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Noriaki Kaneda

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EXAMINER

LI, SHI K

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

51

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/627,098	KANEDA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Shi K. Li	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2006 and 11 April 2007.
- 2a) ☐ This action is **FINAL**.      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11, 13-20 and 22 is/are pending in the application.
- 4a) Of the above claim(s) 9, 10, 18 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 11, 13-17, 20 and 22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 8 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of Species I in the reply filed on 11 April 2007 is acknowledged. The traversal is on the ground(s) that a complete search for each Group would require a search of most, if not all, of the individual classes and subclass and the Applicant submits that an examination of both Groups would not impose a serious burden on the Examiner. This is not found persuasive because the Applicant's argument only addresses sub-class search while the condition for the exception of MPEP §803 requires that both the search and examination of the entire application can be made without serious burden. MPEP §904 addresses search which includes classified search (§904.02(a)), text search, NPL search, specialized database search, etc. In addition to search, an examiner needs to study the retrieved patents, non-patent literature and the claims to determine whether a single document or a combination of two or more documents teach the claimed invention, as well as the examination of the specification and claim language to determine whether they meet applicable patent laws and patent rules. While it may be true that identifying subclasses for both groups is not a burden for the Examiner, the search and examination of the entire set of claims places a serious burden on the Examiner and, therefore, the condition for the exception stated in MPEP §803 is not met by the instant application. Furthermore, one or more of the reasons apply.

Because these inventions are independent or distinct and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

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Because these inventions are independent or distinct and there would be a serious burden on the examiner if restriction is not required because the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

Because these inventions are independent or distinct and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art due to their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

The requirement is still deemed proper and is therefore made FINAL.

Applicant identifies claims 6 and 16-17 for the Species. In addition, claims 1-8, 11, 13-15, 20 and 22 are either generic or readable on the Species. Therefore, claims 1-8, 11, 13-17, 20 and 22 are examined; claims 9-10 and 18-19 are withdrawn from consideration as not directed to the elected Species.

#### ***Allowable Subject Matter***

2. The indicated allowability of claims 6 and 17 is withdrawn in view of the reference(s) to Walach et al. (E. Walach et al., "The Least Mean Fourth (LMF) Adaptive Algorithm and Its Family", IEEE Transaction Theory, Vol. IT-30, No. 2, March 1984). Rejections based on the reference(s) follow.

#### ***Drawings***

3. Figures 1, 2 and 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header

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(as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 13 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13 depends on claim 12. However, claim 12 has been cancelled.

Claim 22 depends on claim 21. However, claim 21 has been cancelled.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-8 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Phanse et al. (U.S. Patent 7,130,366 B2) in view of Walach et al. (E. Walach et al., "The Least Mean Fourth (LMF) Adaptive Algorithm and Its Family", IEEE Transaction Theory, Vol. IT-30, No. 2, March 1984) and Zerguine (A. Zerguine, "Convergence Behavior of the Normalized Least Mean Fourth Algorithm", IEEE 2000).

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Regarding claims 1-2 and 14, Phanse et al. teaches in FIG. 1 a conventional fiber optical transmission system comprising a photo-detector 16 and amplifier 18 for converting an optical signal into an electrical signal  $S_d$ . Phanse et al. teaches in FIG. 5B to process the electrical  $S_d$  with an equalizer 110b and a signal slicer 122b. Phanse et al. teaches in col. 21, lines 27-30 that the weight coefficients for the equalizer can be designed with least-mean square (LMS) method. The difference between Phanse et al. and the claimed invention is that Phanse et al. teaches LMS while the claimed invention claims least-mean 2Nth-order algorithm with N greater than one. Walach teaches a least-mean 2Nth-order (LMN) algorithm, where N is greater than one. Zerguine teaches that NLMF gives smaller error (FIG. 3) or faster convergence (FIG. 4). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to have modified the fiber optical transmission system of Phanse et al. to use a normalized least-mean fourth (NLMF), as taught by Walach and Zerguine, because a NLMF algorithm out-performs LMS or NLMS.

Regarding claims 3 and 15, Phanse et al. teaches in col. 20, line 48 and FIG. 8 finite impulse response filter.

Regarding claims 4-5 and 16, Phanse et al. teaches in FIG. 5C subtractor 128c for producing an error signal  $\epsilon_f$  for controlling the equalizer.

Regarding claims 6 and 17, Walach et al. teaches Eq. (15)

$$\mathbf{W}_{j+1} = \mathbf{W}_j + 2\mu K \epsilon_j^{2K-1} \mathbf{X}_j.$$

Regarding claims 7-8, Phanse et al. teaches in col. 32, lines 51-56 that the invention can be constructed using either analog or digital implementations.

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8. Claims 1-6 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choa (U.S. Patent 6,718,087 B2) in view of Walach et al. (E. Walach et al., "The Least Mean Fourth (LMF) Adaptive Algorithm and Its Family", IEEE Transaction Theory, Vol. IT-30, No. 2, March 1984) and Zerguine (A. Zerguine, "Convergence Behavior of the Normalized Least Mean Fourth Algorithm", IEEE 2000).

Regarding claim 1, 2, and 14, Choa teaches a photo-detector for converting said optical signal to an electrical signal (see figure 6, photo detector 500; paragraph 0061) and an equalizer for removing inter-symbol interference from said electrical signal (see figure 3, adaptive equalizer 150; figure 4 weight adjustment 240; paragraph 0045) said equalizer having a plurality of coefficients configured to be updated (see figure 4 elements 220 and 250). With respect to claim 2, Choa teaches a controller to update said coefficient (see figure 4 Weight updater 240; paragraph 0049). Choa fails to teach a least-mean  $2N$ th-order (LMN) algorithm, where  $N$  is greater than one. However, Walach teaches a least-mean  $2N$ th-order (LMN) algorithm, where  $N$  is greater than one. Zerguine teaches that NLMF gives smaller error (FIG. 3) or faster convergence (FIG. 4). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to have modified the optical receiver of Choa to use a normalized least-mean fourth (NLMF), as taught by Walach and Zerguine, because a NLMF algorithm out-performs LMS or NLMS.

Regarding claim 3 and 15, Choa teaches said equalizer is a finite impulse response filter configured to produce a first output signal responsive to said electrical signal (see figure 4 element 150, output signal 190; paragraph 0043), said first output signal being representative of a

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sum of the associated electrical signal plus a weighted sum of previous ones of the electrical signal (see figure 4 element 130), wherein the previous signals are weighted by said coefficients (see figure 4 element 180).

Regarding claim 4-5 and 16, Choa teaches a slicer to produce a predicted signal for each first output signal received from the finite impulse response filter (see figure 4 decision element 140, output signal 210 and 220; paragraph 0024); a subtractor to produce an error signal proportional to the difference between said first output signal and a corresponding predicted signal or training signal (see figure 4 adder 130); and a controller configured to update said coefficients responsive to the error signal (see figure 4 weight updater 240).

Regarding claims 6 and 17, Walach et al. teaches Eq. (15)

$$\mathbf{W}_{j+1} = \mathbf{W}_j + 2\mu K \varepsilon_j^{2K-1} \mathbf{X}_j.$$

9. Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choa and Walach et al. and Zerguine as applied to claims 1-6 and 14-17 above, and further in view of Kaleh (U.S. Patent 5,048,058).

Choa and Walach et al. have been discussed above in regard to claims 1-6 and 14-17. The difference between Choa and Walach et al. and the claimed invention is that Choa and Walach et al. do not teach whether the equalizer is analog or digital. However, Kaleh teaches in col. 7, lines 16-26 that an equalizer can be implemented in the form of an analog equalizer or digital equalizer. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to have modified the modified optical receiver of Choa and Walach et al. by implementing the equalizer either as digital form or analog form based on other factors such as cost, accuracy and product market as a



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design choice. The Examiner recognizes that the claimed difference exist not as a result of an attempt by applicant to solve a problem but merely amounts to selection of expedients known to an artisan of ordinary skill as design choices.

10. Claims 11, 13, 20 and 22, with the assumption that claim 13 depends on claim 11 and claim 22 depends on claim 20, are rejected under 35 U.S.C. 103(a) as being unpatentable over Phanse et al. (U.S. Patent 7,130,366 B2) in view of Ramaswami et al. ("Optical Network: A practical Perspective", Second Edition, by R. Ramaswami et al., Morgan Kaufmann, 2002, pp. 258-263).

Regarding claims 11 and 20, Phanse et al. teaches in FIG. 1 a conventional fiber optical transmission system comprising a photo-detector 16 and amplifier 18 for converting an optical signal into an electrical signal Sd. Phanse et al. teaches in FIG. 5B to process the electrical Sd with an equalizer 110b and a signal slicer 122b. Phanse et al. indicates automatic feedback control of the threshold with a dash line pointing to the signal slicer. The difference between Phanse et al. and the claimed invention is that Phanse et al. does not teach adjust the threshold based on signal distribution. However, it is well known in communication theory that decision threshold should be chosen based on probability density functions of the "0" and "1" of the data stream. For example, Ramaswami et al. teaches in FIG. 4.8 that a decision threshold  $I_{th}$  should be chosen based on the signal distribution as given by Eq. (4.12), which minimizes the bit error rate. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the fiber optical transmission system of Phanse et al. because using such a threshold minimizes bit error rate. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust decision threshold based on signal

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distribution, as taught by Ramaswami et al., in the fiber optical transmission system of Phanse et al. because using such a threshold minimizes bit error rate.

Regarding claims 13 and 22, it is obvious that a varying non-stationary channel has a changing signal distribution and, therefore, the threshold should be adjusted accordingly.

### ***Response to Arguments***

11. Applicant's arguments with respect to claims 11 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (7:30 a.m. - 4:30 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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skl

12 June 2007

A handwritten signature in black ink, appearing to read 'Shi K. Li'.

**Shi K. Li**  
**Primary Patent Examiner**